WHAT IS CLAIMED IS:

1. An electro-optical switch, comprising:

a photonic crystal having first and second waveguides provided therein, wherein the first waveguide is adjacent to the second waveguide along a coupling length, and a change in conductance along the coupling length provides electro-optical switching between the first and second waveguides.

2. An electro-optical switch as recited in claim 1, wherein said photonic crystal comprises a periodic array of silicon pillars arranged in a square lattice.

3. An electro-optical switch as recited in claim 1, wherein said photonic crystal comprises a periodic array of air holes arranged in a hexagonal lattice.

4. An electro-optical switch as recited in claim 1, wherein the propagation constants of the first and second waveguides are equivalent.

5. An electro-optical switch as recited in claim 4, wherein the first and second waveguides electro-optically couple to each other at all optical wavelengths.

6. An electro-optical switch as recited in claim 1, wherein the first and second waveguides are identical.

7. An electro-optical switch as recited in claim 6, wherein the first and second

waveguides electro-optically couple to each other at all optical wavelengths.

8. A photonic bandgap integrated circuit, comprising:

a photonic crystal; and

an electro-optical switch formed by providing first and second waveguides in said photonic crystal adjacent each other along a coupling length, wherein a change in conductance along the coupling length provides electro-optical switching between the first and second waveguides.

9. A photonic bandgap integrated circuit as recited in claim 8, wherein said photonic crystal comprises a periodic array of silicon pillars arranged in a square lattice.

10. A photonic bandgap integrated circuit as recited in claim 8, wherein said photonic crystal comprises a periodic array of air holes arranged in a hexagonal lattice.

11. A photonic bandgap integrated circuit as recited in claim 8, wherein the propagation constants of the first and second waveguides are equivalent.

12. A photonic bandgap integrated circuit as recited in claim 11, wherein the first and second waveguides electro-optically couple to each other at all optical wavelengths.

13. A photonic bandgap integrated circuit as recited in claim 8, wherein the first and second waveguides are identical.

14. A photonic bandgap integrated circuit as recited in claim 13, wherein the first and second waveguides electro-optically couple to each other at all optical wavelengths.

15. A coupled photonic crystal waveguided system, comprising:

first and second photonic bandgap waveguides provided adjacent to each other along a coupling length, wherein a change in conductance along the coupling length provides electro-optical switching between said first and second photonic bandgap waveguides.

16. A coupled photonic crystal waveguided system as recited in claim 15, wherein the photonic crystal comprises a periodic array of silicon pillars arranged in a square lattice.

17. A coupled photonic crystal waveguided system as recited in claim 15, wherein the photonic crystal comprises a periodic array of air holes arranged in a hexagonal lattice.

18. A coupled photonic crystal waveguided system as recited in claim 15, wherein the propagation constants of said first and second photonic bandgap waveguides are equivalent.

19. A coupled photonic crystal waveguided system as recited in claim 18, wherein said first and second photonic bandgap waveguides electro-optically couple to each other at all optical wavelengths.

20. A coupled photonic crystal waveguided system as recited in claim 15, wherein

said first and second photonic bandgap waveguides are identical.

21. A coupled photonic crystal waveguided system as recited in claim 20, wherein said first and second photonic bandgap waveguides electro-optically couple to each other at all optical wavelengths.

22. A method for providing an electro-optical switch, comprising:

providing a photonic crystal;

providing first and second waveguides in the photonic crystal adjacent to each other along a coupling length; and

changing the conductance along the coupling length to provide electro-optical switching between the first and second waveguides.

23. A method for providing an electro-optical switch as recited in claim 22, wherein the photonic crystal comprises a periodic array of silicon pillars arranged in a square lattice.

24. A method for providing an electro-optical switch as recited in claim 22, wherein the photonic crystal comprises a periodic array of air holes arranged in a hexagonal lattice.

25. A method for providing an electro-optical switch as recited in claim 22, wherein the propagation constants of the first and second waveguides are equivalent.

26. A method for providing an electro-optical switch as recited in claim 25, wherein

the first and second waveguides electro-optically couple to each other at all optical wavelengths.

27. A method for providing an electro-optical switch as recited in claim 22, wherein the first and second waveguides are identical.

28. A method for providing an electro-optical switch as recited in claim 27, wherein the first and second waveguides electro-optically couple to each other at all optical wavelengths.